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RESEARCH ARTICLE

Two new species and new records of Neanuridae (Hexapoda: Collembola) from Brazilian central Amazonia

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ABSTRACT. Two new species of Neanuridae from the Amazon Rainforest of Northern Brazil are described and illustrated. The new species *Friesea multiclavata* **sp. nov.** (holotype male in MNRJ: Brazil, Amazonas State) belongs to the reducta-group and represents the first record of Frieseinae for Amazonas State in Brazil. Within Pseudachorutinae, the new species *Furculanurida boiuna* **sp. nov.** (holotype male in MNRJ: Brazil, Amazonas State) represents the third species of this genus without eyes and body pigment, together with *Furculanurida africana* (Massoud, 1963) – type species of the genus – and *Furculanurida emucronata* Zon et al., 2014, both from Ivory Coast, in Africa. Lastly, an indefinite species of *Ectonura* sp. (Neanurinae) is the second record of the genus for the Neotropical Region.

KEY WORDS. Frieseinae, Neanurinae, Neotropics, Pseudachorutinae, taxonomy.

INTRODUCTION

Collembola has a worldwide distribution with a large number of species (Bellinger et al. 2018). Despite the several taxonomic contributions about springtails that have accumulated over the last years, there are few studies on the Brazilian fauna, which has resulted in vast areas lacking any springtail record (Abrantes et al. 2010, 2012, Zeppelini et al. 2018). In the state of Amazonas, for example, there are still several completely unexplored ecosystems for springtails (Abrantes et al. 2010, 2012). As for now, the Collembola fauna from the Amazon is second in terms of recorded species to the Atlantic Forest (Zeppelini et al. 2018).

Small river branches in the Amazon, known as 'Igarapés', are considered an important component of the forest. They provide an essential structural heterogeneity and sustain a highly diverse fauna. Their primary source of energy comes from organic matter from the riparian vegetation of adjacent forests (Lima and Gascon 1999, Nessimian et al. 1998).

Poduromorpha is the second most numerous among Collembola orders, with 11 families, 331 genera and about 3300 species (Bellinger et al. 2018). Brazil has representatives of seven families – Neanuridae, Brachystomellidae, Hypogastruridae, Onychiuridae, Tullbergiidae, Odontellidae and Isotogastruridae (Zeppelini et al. 2018).

Neanuridae comprises six subfamilies, three of which occur in Brazil: Frieseinae, Neanurinae and Pseudachorutinae. Pseudachorutinae and Frieseinae, with 466 and 111 species, respectively and Neanurinae with only six recorded species (Zeppelini et al. 2018).

Among the 178 species of *Friesea* Dalla Torre, 1895, 11 are recorded for Brazil. Nine of those were recorded only for the state of Rio de Janeiro: *Fr. boitata* Queiroz & Mendonça, 2015, *Fr. claviseta* Axelson, 1900, *Fr. cubensis* Potapov & Banasko, 1985, *Fr. curupira* Queiroz & Mendonça, 2015, *Fr. josei* Palacios-Vargas, 1986, *Fr. jurubatiba* Silveira & Mendonça, 2018, *Fr. magnicornis* Denis, 1931, *Fr. mirabilis* (Tullberg, 1871) and *Fr. reducta* Denis, 1931. The other two species, *Fr. sublimis* Macnamara, 1921 and *Fr. arlei* Massoud & Bellinger, 1963, were recorded for Espírito Santo and Mato Grosso States, respectively (Bellinger et al. 2018, Zeppelini et al. 2018).

Furculanurida Massoud, 1967 includes 14 described species from Africa and Americas, while in Brazil there are four recorded species: *Fu. nessimiani* Fernandes & Mendonça, 2002 and *Fu. tropicalia* Queiroz & Fernandes, 2011 from the Atlantic Forest and *Fu. belemensis* Arlé & Rufino, 1976 and *Fu. goeldiana* Arlé & Rufino, 1976 from the Amazon Rainforest (Bellinger et al. 2018, Zeppelini et al. 2018).

Ectonura has 17 species described in the world and only one, *E. snowdeni* Queiroz & Deharveng, 2015, recorded for Brazil (Bellinger et al. 2018, Zeppelini et al. 2018).

In this paper we describe, illustrate and provide diagnosis for two new species of Neanuridae of the genera *Friesea* and *Furcu-*

lanurida. In addition, *Ectonura*, poorly known in the neotropics, is recorded for the first time in the Amazon, representing the second record for the Neotropical Region. The new species, *Furculanurida boiuna* sp. nov. is the third of the genus without eyes and pigment and the first with these characteristics found outside Ivory Coast, in Africa (type locality of the genus). *Friesea multiclavata* sp. nov., represents the first record of this genus for the state of Amazonas.

MATERIAL AND METHODS

Specimens were collected using trays, also known as yellow traps, placed upon soil litter found near Igarapés in five municipalities from central Amazon, Amazonas State. These trays, containing a mixture of water and detergent, were kept for 3–5 days and the captured fauna was sorted and mounted on glass slides, using Mark-André II as medium, and studied under optic microscope.

The terminology for antennal chaetotaxy is after D'Haese (2003); dorsal head chaetotaxy after Cassagnau (1974); tibiotarsal chaetotaxy after Deharveng (1983); labial chaetotaxy according to Massoud (1967); thorax and abdomen chaetotaxy according to Potapov and Banasko (1985).

Abbreviations as follows: (AM) Amazonas State; (CM) Cleide Mendonça code collection; (ES) Espírito Santo State; (MNRJ) Coleção Entomológica do Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil; (NC) North Carolina State; (PA) Pará State; (RJ) Rio de Janeiro State; (Ant) antennal segment; (Sgd) dorsal guard S-chaeta of antennal III organ; (Abd) abdominal segment; (Scx) subcoxa; (Th) thoracic segment; (Tita) tibiotarsus(i).

TAXONOMY

Friesea Dalla Torre, 1895

Type species: *Triaena mirabilis* Tullberg, 1871

Friesea multiclavata sp. nov.

http://zoobank.org/160FE3E9-30D0-4FF2-BA24-584A0B0371D4
Figs 1–9, Tab. 1

Description. Body length: 0.51 mm (Holotype). Habitus cylindrical and robust, typical of *Friesea*. Color bluish-gray with ventral of head, legs and sternites white. Secondary granules moderately developed. Antennae shorter than cephalic diagonal. Ratio antenna: cephalic diagonal = 1: 1.4. Ant IV with apical bulb simple and subapically displaced on ventral side; subapical organite, dorsolateral S-microchaeta and 6 S-chaetae present dorsally (Fig. 1). Sensory organ of Ant III formed by five S-chaetae: two internal S-microchaetae bent externally and freely exposed; two subcylindrical guard S-chaetae and one smaller ventral S-microchaeta (Fig. 2). Ant I with 7 simple chaetae and Ant II with 11 chaetae, of which 10 are simple and one is strongly spatulate dorsoexternally (see detail in Fig. 7).

Head with 8+8 eyes in heavily pigmented eye-patch. Mandible strong with 5 unequal teeth; basal tooth measuring approximately twice the size of the others; maxilla head typical of the genus, with three lamellae; internal lamella with about 6 denticles (Fig. 3). Buccal cone short; Pre-labral/labral chaetae arranged according to the formula: 2/5,5,4. Labium typical of the genus, with papillated chaeta L, chaeta F about twice the length of E (Fig. 4).

Chaetotaxy of legs I, II, III. Subcoxae I 1,3,3; Subcoxae II 0,2,2; Coxae 3,6,7; Trochanters 5.4,4; Femora 11,10,10; Tibiotarsi 18,18,17, without M chaeta. Tibiotarsi I-III with 4,5,5 clavate tenent hairs, respectively (2 dorsal and 2 ventral on Tita I; 3 dorsal and 2 ventral on Tita II and III) (Figs 5, 6). Subcoxa I of legs I-III and lateral region of Abd V with hemispheric tegumentary protuberance constituted of primary granules (see detail of Fig. 7). Ungues toothless.

Dorsal body. Composed of short ordinary chaetae, slender S-chaetae, slightly longer than ordinary, and strongly clavate chaetae laterally on head and abdominal tergites IV-VI (Fig. 7). Head chaetotaxy composed of a0, d0, d2-5, sd1-5, oc1-3, c1-2, p1-2. Th I with 2+2 simple chaetae. Abd IV with 2+2 small clavate dorsolateral chaetae; Abd V with 2+2 long clavate dorsal chaetae; Abd VI with 10 strongly clavate chaetae arranged in three linear rows, as 4,4,2 (Fig. 7 and detail). Formula of S-chaetae by half tergite: 022/11111.

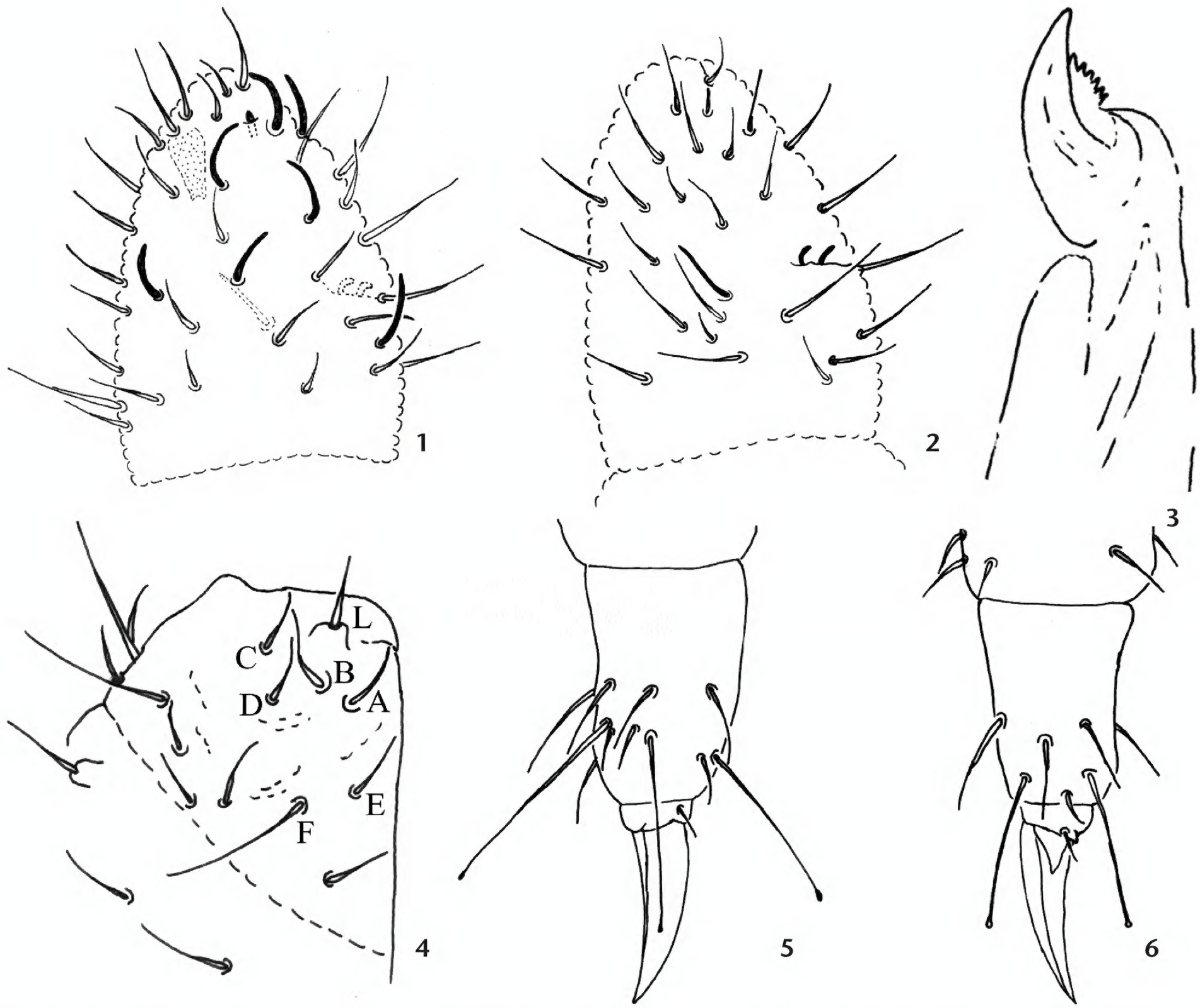
Ventral tube with 3+3 chaetae. Abdominal sternites II-V with 4+4, 5+5, 12+12, 5+5 chaetae, respectively (Fig. 8). Tenaculum and furca absent; furcal area with 2+2 microchaetae. Anal valves with 11-12 chaetae and one hr chaeta. Male genital plate with 2+2 pregenital chaetae, 4+4 eugenital and 9 circungenital chaetae (Figs 8, 9).

Material examined. Holotype male. BRAZIL, Amazonas State: Presidente Figueiredo municipality, forest leaf litter of Amazon Rainforest, coordinates 02°02'56"S, 60°06'08"W, 23.IV.2008, Hamada, Azevedo, Neiss, Silva & Meneses leg. (CM/MNRJ slide number 2538).

Etymology. The specific name multiclavata is derived from Latin, meaning bearing nails, and is an allusion to the numerous clavate chaetae arranged along the tergites.

Remarks. *Friesea multiclavata* sp. nov. can be included in the reducta-group, which is composed of 14 species, according to Queiroz and Mendonça (2015), based on the following characters: 8+8 eyes and absence of furca and anal spines (Table 1). Despite the absence of anal spines, most species in this group, with the exception of *Friesea africana* Delamare Deboutteville, 1953, have some degree of chaetae modification on Abd VI. In this sense, the new species is unique within this group since it also presents modified chaetae on head and antennae.

Friesea multiclavata sp. nov. is very similar to *Fr. albithorax* Massoud & Thibaud, 1980 (Antilles), *Fr. lobulata* Palacios-Vargas & Díaz, 1986 and *Fr. mucumontana* Palacios-Vargas & Díaz, 1986 (Venezuela) mainly for sharing the 2+2 chaetae on Th I, clavate chaetae on body and 18,18,17 chaetae on tibiotarsi I-III.



Figures 1–6. *Friesea multiclavata* sp. nov. holotype male: (1) Ant III-IV in dorsal view; (2) Ant III-IV in ventral view; (3) maxillae in dorsal view; (4) half labium in ventral view; (5) Tita II in ventrolateral view; (6) Tita II in dorsolateral view.

However, *Fr. multiclavata* sp. nov. has a simple apical bulb, 4,5,5 tenent hairs on tibiotarsi and ungues without teeth while *Fr. lobulata* has a trilobed apical bulb, only two clavate tenent hairs on legs I-III and toothed unguis. *Friesea multiclavata* sp. nov. is uniformly bluish-gray colored, while *Fr. albithorax* presents white thoracic tergites and the rest of the body is grey. Moreover, *Fr. multiclavata* sp. nov. is unique among the four species here referred, by the 10 strongly clavate chaetae on Abd VI, while the others have six (*Fr. lobulata* and *Fr. mucumontana*) or eight (*Fr. albithorax*) clavate chaetae.

Friesea multiclavata sp. nov. has an inconspicuous tegumentary protuberance on subcoxa I of legs I-III and ventrolaterally on Abd V (Fig. 7), also found in *Fr. reducta* and *Fr. boitata*. This structure was first mentioned by Massoud and Thibaud (1980) in specimens of *Fr. reducta* from Lesser Antilles. Later on, *Fr. boitata* was also found to possess the same structures on subcoxae I and Abd V. According to Queiroz and Mendonça (2015), it is possible that these structures were not mentioned in other descriptions as they may have not been properly visualized.

Although there are no phylogenetic studies for Neotropical species of *Friesea*, the proposition of a group relying on morphological similarities, such as reducta-group, represents the first step towards a better understanding of the genus' morphological diversity in the biogeographical region. As proposed by Queiroz and Mendonça (2015), it is possible to distinguish "subgroups" of species within this group based on the number of chaetae on Th I, being 2, 3 or 4 by half tergite. Despite that, we believe that the striking resemblance of these species, especially those

Table 1. Main characters of species of *Friesea*, belonging to reducta-group. Modified from Queiroz and Mendonça (2015).

Species	Apical bulb	Th I chaetae	Chaetae on Tita I-III	Clavate tenent hairs Legs I-III	Furcal area chaetae	Modified chaetae on Abd VI [number (arrangement)]	Type Locality
Fr. africana Delamare Deboutteville, 1953	?	?	?	–	?	–	Tanzania
Fr. albithorax Massoud & Thibaud, 1980	simple	2+2	(18,18,17)?	4,5,5	?	clavate = 8 (4,4)	Antilles
Fr. boitata Queiroz & Mendonça. 2015	simple	4+4	18,18,17	4,5,5	4	slightly clavate = 6 (4,2)	Brazil (RJ)
Fr. bonariensis Izarra, 1965	simple	4+4	?	2,2,2	?	blunt = 6 (4,2)	Argentina
Fr. josei Palacios-Vargas, 1986	simple	3+3	17,17,16	3,3,3	?	spiniform = 10	Puerto Rico
Fr. jurubatiba Silveira & Mendonça, 2018	simple	4+4	18,18,17	4,5,5	4	clavate = 8 (4,4)	Brazil (RJ)
Fr. lobulata Palacios-Vargas & Díaz, 1986	trilobed	2+2	18,18,17	2,2,2	?	slightly clavate = 6?	Venezuela
Fr. marianoius Palacios-Vargas, 2005	simple	?	17,17,16	–	6	strongly clavate = 10 (4,4,2)	México
Fr. mucumontana Palacios-Vargas & Díaz, 1986	simple	2+2	18,18,17	4,5,5	?	clavate = 6 (4,2)	Venezuela
Fr. reducta Denis, 1931*	simple	3+3	(18,18,17)?	4,5,5	?	strongly clavate = 10 (4,4,2)	Costa Rica
Fr. sensillata Palacios-Vargas & Díaz, 1986	simple	4+4	18,18,17	8,9,9	?	strongly clavate = 10 (4,4,2)	Venezuela
Fr. steineri Simón, 1975	simple	3+3	17,17,16	–	6	slightly clavate = 9 (4,4,1)	Spain
Fr. tepetlana Palacios-Vargas, 1986	simple	4+4	17,17,17	4,5,5	4	spiniform = 6 (4,2)	México
Fr. tzontli Palacios-Vargas & Acosta, 1994	simple	4+4	17,17,16	4,5,5	?	clavate = 10 (4,4,2)	México
Fr. xitlensis Palacios-Vargas & Acosta, 1994	simple	4+4	18,18,17	4,4,5	?	spiniform = 6 (4,2)	México
Fr. multiclavata sp. nov.	simple	2+2	18,18,17	4,5,5	4	strongly clavate = 10 (4,4,2)	Brazil (AM)

*In part after illustrations and characterization of *Fr. reducta* by Massoud and Thibaud (1980).

previously mentioned with 2+2 chaetae on Th. I, suggests close relationship between them.

While further studies may clarify phylogenetic relationships, comparative morphological studies are still the mainframe for species recognition. In this sense, all described species in the mentioned subgroup can be distinguished mainly based on body chaetotaxy, especially chaetae morphology, such as clavate chaetae. This character is considered to be consistent and, therefore, it is widely used, especially for recently described species.

Furculanurida Massoud, 1967

Type species: *Micranurida africana* Massoud, 1963

Furculanurida boiuna sp. nov.

http://zoobank.org/81E85E27-2187-45B0-AADB-B45EC4E90704
Figs 10–22, Tab. 2

Description. Body length 0.9 mm (Holotype). Habitus elongated and cylindrical, paratergites not developed. Secondary granules moderately developed. Color white, in ethanol. Antennae shorter than cephalic diagonal. Ratio antenna: cephalic diagonal = 1: 1.6. Ant IV with trilobed apical bulb, subapical organite apically displaced, next to apical bulb; 6 long S-chaetae (S1-S4, S8, S9?); dorsolateral S-microchaeta absent. Ant III and Ant IV dorsally fused. Antennal organ III with two inner small and curved S-microchaetae, two subcylindrical guard S-chaetae and one S-microchaeta ventrally; dorsal guard S-chaeta apically displaced, towards Ant IV and aligned to S2 and S3, and as long as S-chaetae of Ant IV (Figs 10, 11). Ant II with 11 chaetae and Ant I with 6 chaetae.

Head. Eyes absent, PAO circular with 8–9 vesicles, rosette-like (Fig. 12). Central head chaetotaxy with d1–5, sd3–5 (chaetae sd1,2 absent – probable homology), oc1–3, p1–3; c row of chaetae is absent. Maxilla styliform; Mandible with 7 teeth: 2 large basal, 3 subequal intermediate and 2 apical (Fig. 13). Pre-labral/labral chaetae arranged according to the formula: 4/2,3,5,2 (Fig. 14). Labium truncate with C and D chaeta apically displaced (Fig. 15).

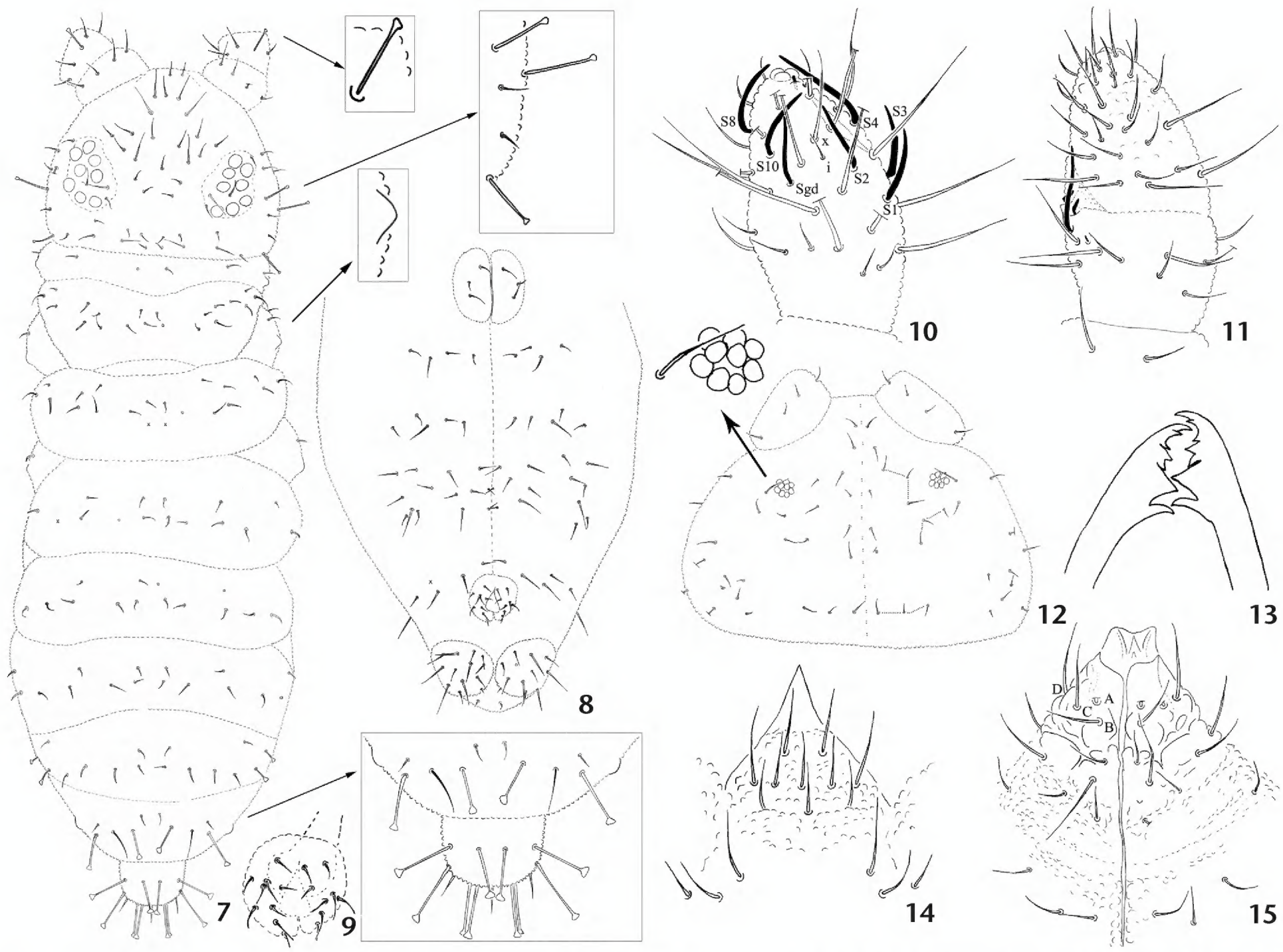
Chaetotaxy of legs I, II, III. Subcoxa I 1,3,3; Subcoxa II 0,2,2; Coxa 3,6,8; Trochanter 6,6,6; Femur 12,12,11; Tibiotarsus 19,19,18; M chaetae basally displaced (Figs 16–18). Unguis of leg I with a strong basal tooth on inner edge (Fig. 16); unguis of legs II and III with small basal tooth on inner edge (Fig. 18).

Dorsal chaetotaxy of tergites consisting of simple, short and subequal chaetae and thin and long S-chaetae. Formula of S-chaetae by half tergite: 022/11111. Ratio ordinary chaeta: S-chaeta= 1: 4.5. Th I with 2+2 chaetae. Th II with dorsolateral S-microchaetae; Th II and III with one lateral ordinary chaeta posteriorly displaced. Abd VI with 8 chaetae, which 4 arranged in a row (Fig. 19).

Ventral tube with 3+3 chaetae. Abdominal sternites II-V with 2+2, 2+2, 5+5 and 3+3 chaetae, respectively (Fig. 20). Tenaculum with 3+3 teeth. Furca well developed: manubrium with 20 chaetae, dens with 5–6 chaetae; mucro with two lamellae and slightly curved apex (Fig. 21). Ratio mucro: dens = 1: 2.3. Each anal valve with 13 chaetae and 3 hr. Genital plate of male with 5+5 eugenital chaetae and 10 circungenital chaetae (Fig. 22).

Material examined. Holotype male. BRAZIL, Amazonas State: Manacapuru municipality, forest leaf litter of Amazon Rainforest, coordinates 03°12′23″S, 60°40′21,0″W, 29.III.2008, Nessimian, Querino, Pepinelli, Azevedo & Neiss leg. (CM/MNRJ slide number 2523).

Etymology. The name of this species is a reference to the legendary Amazonian giant snake called Boiuna, in Amerindian



Figures 7–15. (7–9) *Friesea multiclavata* sp. nov. holotype male: (7) dorsal body chaetotaxy with details of clavate chaetae of Ant II, lateral head and Abd V-VI and tegumentary protuberances of Scx I of legs; (8) ventral chaetotaxy of Abd I-VI; (9) genital plate of male. (10–15) *Furculanurida boiuna* sp. nov. holotype male: (10) dorsal view of Ant III-IV; (11) ventral view of Ant III-IV; (12) dorsal head chaetotaxy with detail of PAO; (13) mandibles; (14) labrum; (15) labium.

Tupi Language. According to the legend, a huge snake grows to unrealistic proportions and, as it crawls through dry land, it leaves behind the grooves that later on become the Igarapés.

Remarks. The broadness and vagueness of the current diagnosis for *Furculanurida* was discussed in some studies involving species of this genus and its similarity to other genera (Thibaud and Palacios-Vargas 2000, Queiroz and Fernandes 2011, Zon et al. 2014). Recently, Zon et al. (2014) drew attention to the fact that *Furculanurida* has a poor definition, with many morphological features overlapping with the diagnosis of *Pseudachorutes* Tullberg, 1871 and *Stachorutes* Dallai, 1973 (see Table 2). The most conflicting aspects are related to number of eyes, PAO shape and number of vesicles and furcal development, as well as antennal chaetotaxy, more specifically the presence/absence of dorsolateral S-microchaeta on Ant IV (Queiroz and Fernandes 2011, Zon et al. 2014). Therefore, a revision of the genus is needed, along with a redescription of the type species, *Fu. africana* (Massoud, 1963).

According to Massoud (1967), *Fu. africana* has no eyes and no body pigments but has a well-developed furca. Regarding these characteristics, until now, *Fu. emucronata* Zon et al., 2014 was the only species similar to *Fu. africana*, except for the absence of mucro. In this sense, the new species *Fu. boiuna* sp. nov. represents the third in the genus without eyes and body pigment.

In relation to these three species, the most remarkable similarity among them is: the presence of a somewhat swollen branch of mandible and two basal strong teeth, although some minor differences can be observed in the total number of apical teeth. *Furculanurida boiuna* sp. nov., together with *Fu. emucronata*, has seven teeth on the mandible and the ungues exhibit a tooth on their inner edge, while *Fu. africana* mandible has nine teeth and the ungues are devoid of teeth.

Table 2. Main characters of all known species of *Furculanurida*. Modified from Queiroz and Fernandes (2011).

Species	Color	Ant IV S-chaetae	Ant IV S-microc.	Eyes per side	PAO vesicles	PAO form	Mandible teeth	VT chaetae	Chaetae on each dens	Locality
Fu. africana (Massoud, 1963)	white	6	?	–	8-10	circular	9	?	6	Ivory Coast
Fu. arawakensis Thibaud & Massoud, 1983	blue	6	–	4	5-9	circular	7	3+3	6	Lesser Antilles
Fu. belemensis Arlé & Rufino, 1976	blue-gray	6	?	5	8-9	circular	4-6	?	6	Brazil (PA)
Fu. duodecimoculata Thibaud & Massoud, 1980*	light blue	7	?	6	11	circular	4-5	3+3	6	Morocco
Fu. emucronata Zon, Tano & Deharveng, 2014	white	7	–	–	13-16	elliptical	7	3+3	6	Ivory Coast
Fu. furculata (Salmon, 1956)	deep blue	7	?	2	4	circular	7	?	6	Rwanda
Fu. goeldiana Arlé & Rufino, 1976	blue-gray	6	?	7	7-10	circular	4	?	6	Brazil (PA)
Fu. grandcolasorum Weiner & Najt, 1998	blue-gray	6	–	5	9-10	elliptical	6	3+3	5	Tanzania
Fu. guatemalensis Palacios-Vargas & Gao, 2009	gray	6	+	5	15	elliptical	3-4	4+4	6	Guatemala
Fu. langdoni Bernard, 2007	violet-blue	?	+	5	20-22	elliptical	6	4+4	5	USA (NC)
Fu. longisensillata Najt, Thibaud & Weiner, 1990	deep blue	6	–	6	6-7	circular	10	3+3	6	French Guiana
Fu. nessimiani Fernandes & Mendonça, 2002	deep blue	7	–	6	6	circular	5	3+3	6	Brazil (SP)
Fu. septemoculata Palacios-Vargas & Gao, 2009	gray-violet	6	+	7	14	elliptical	2	4+4	6	Guatemala
Fu. tropicalia Queiroz & Fernandes, 2011	blue-gray	6	–	8	8-10	circular	4	3+3	6	Brazil (ES)
Fu. boiuna sp. nov.	white	6	–	–	8-9	circular	7	3+3	6	Brazil (AM)

**Furculanurida duodecimoculata* is the only species with 2+2 teeth on tenaculum, while the others show 3+3 teeth. The descriptions of *Fu. africana*, *Fu. belemensis* and *Fu. goeldiana* makes no reference to number of teeth on tenaculum.

Despite the mentioned similarities, *Fu. boiuna* sp. nov. shows a complete furca, while in *Fu. emucronata* it is incomplete, without mucro. Moreover, *Fu. emucronata* has 7 S-chaetae on Ant IV and between 13–16 vesicles on PAO of an elliptical shape, while *Fu. boiuna* sp. nov. shows 6 S-chaetae on Ant IV and 8–9 vesicles arranged in circular shape.

From a biogeographical point of view, the fact that the Neotropical *Fu. boiuna* sp. nov. is the first species outside of Africa with these set of characters is of considerable relevance. This indicates that a more widespread distribution, i.e. holotropical, is possible and raises questions regarding Pseudachorutinae distribution throughout the tropics. In this sense, despite their rareness, since few specimens are known from these three species, e.g., *Fu. africana* is known only by the holotype, these eyeless species are important for Pseudachorutinae taxonomy.

It must be highlighted that the new species clearly fits the recently proposed Arlesia-group of genera (Queiroz and Zeppelini 2017). Except for an elongated Sgd, almost subequal to Ant IV S-chaetae, Ant III-IV chaetotaxy is doubtlessly similar to the mentioned group of genera. For example *Fu. boiuna* sp. nov. has trilobed apical bulb; absence of ms; presence of S1–4, S8 and S10; x chaeta between a1 and i chaeta; and apically displaced Sgd. Regarding head and thorax chaetotaxy, the pattern similarity is also evident. On head: the reduced sd chaetae, absence of c row of chaetae, as well as only p1–3 chaeta on head. On thorax: Th. I with only 2+2 chaetae; Th. II and III with one dorsolateral chaeta posteriorly displaced.

In the same sense, according to original illustrations provided by Zon et al. (2014) for *Fu. emucronata*, it is possible to recognize one main chaetotaxal difference from the proposed *Arlesia* group: the absence of one dorsolateral chaeta on Th. II and III, probably the posteriorly displaced one. However, regarding all other chaetotaxy features of Ant III-IV (S10 is interpreted as S9 by Zon et al. 2014), head (sd with fewer chaetae – sd2–5? – and c row absent) and tibiotarsi (although not drawn, M chaetae position is clearly basally displaced), it can also be placed inside the *Arlesia* group.

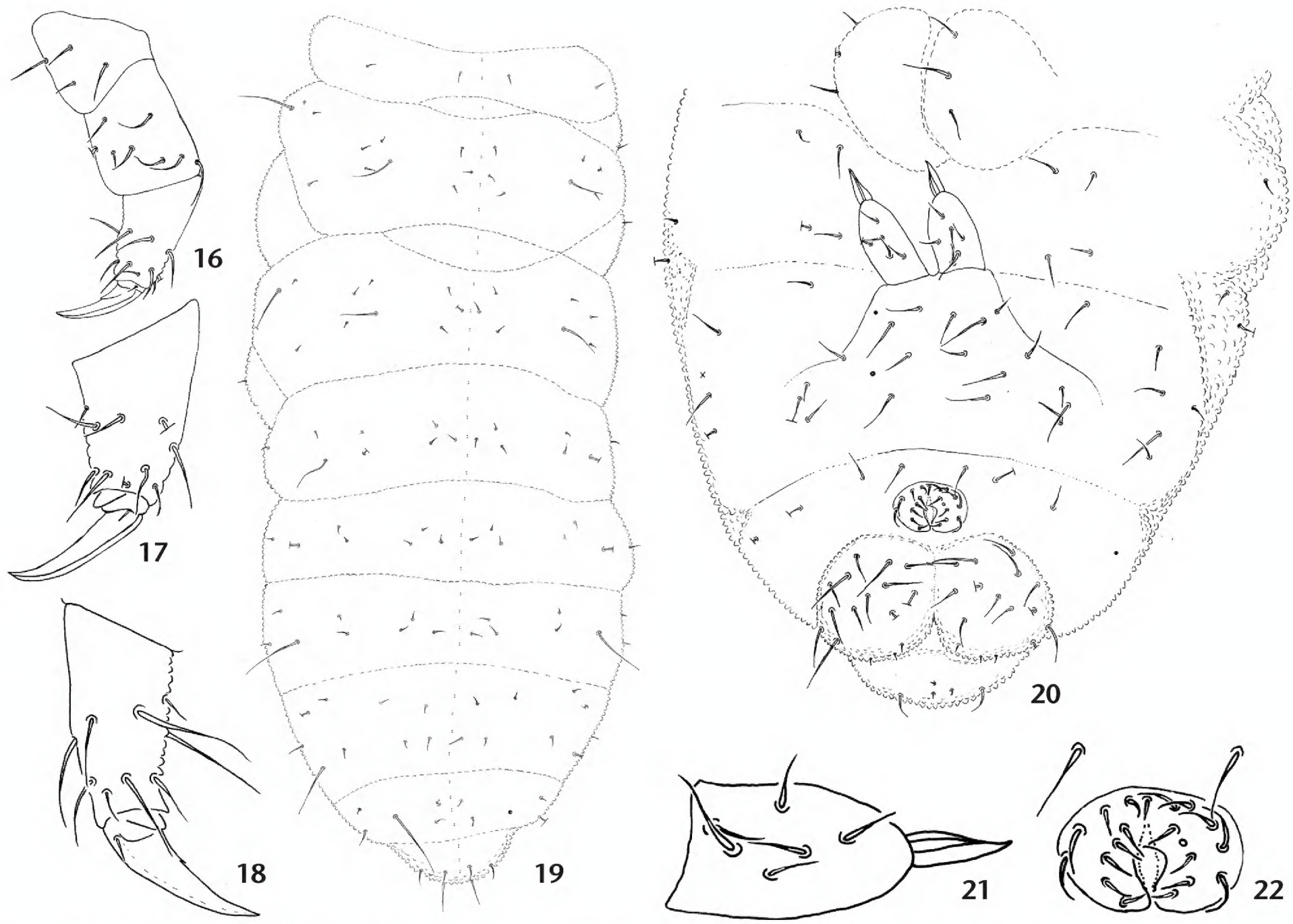
In short, as advocated by Queiroz and Fernandes (2011) and Zon et al. (2014), it should be reinforced that *Furculanurida*, now with 15 species (see Table 2), needs to be revised. We estimate that after such review, only these three species, *Furculanurida boiuna* sp. nov., *Fu. emucronata* and *Fu. africana*, would remain within the genus. However, further analyses must be made to stablish species relationships as well as their character evolution.

Ectonura Cassagnau, 1980

Ectonura sp.

Material examined. One on slide. BRAZIL, Amazonas State: Presidente Figueiredo municipality, forest leaf litter of Amazon Rainforest, coordinates 02°01'13"S, 59°49'29"W, 20.IV.2008, Hamada, Azevedo, Neiss, Pes & Meneses leg. (CM/MNRJ slide number 2535).

Remarks. Neanurinae includes seven tribes worldwide (Lobellini, Morulodini, Neanurini, Paranurini, Paleonurini and Sensillanurini) and is poorly known in the Neotropical region, with 75 recorded species – around 10% of a total of approximately 750 species. Only Paleonurini occurs in Brazil, with five genera and six species, *Australonura gili* Queiroz & Deharveng, 2014, *Australonura neotropica* Queiroz & Deharveng, 2014, *Ectonura snowdeni*, *Itanura brasiliensis* Arlé, 1959, *Paleonura nuda* Cassagnau & Oliveira, 1990 and *Pronura amazonica* Cassagnau & Oliveira, 1990, the last two found in the Amazon Region (Zeppelini et al. 2018). *Ectonura* includes 17 species around the world, 11 of them from New Caledonia, five from South Africa and only one, *Ectonura snowdeni*, from mountains in the state



Figures 16–22. *Furculanurida boiuna* sp. nov. holotype male: (16) dorsolateral view of leg I; (17) ventrolateral view of Tita I; (18) ventrolateral view of Tita II; (19) dorsal thorax and abdomen chaetotaxy; (20) ventral chaetotaxy of Abd I-VI; (21) dens and mucro; (22) genital plate of male.

of Minas Gerais, southeast Brazil. Moreover, the occurrence of *Ectonura* sp. from Australia was mentioned in an ecological work, but without a formal species description (Greenslade and Deharveng, 1990). A single specimen of *Ectonura* was found in a sample collected next to Amazonian Igarapés from Presidente Figueiredo municipality. Due to its poor state of conservation, only diagnostic characteristics for the genus level were identifiable, especially the central cephalic region with few tubercles and chaetal group arrangement. Despite being impossible to identify at species level, it still accounts for the second record of the genus for Neotropical Region and the first for the State of Amazonas, which implies a wider distribution within the tropics of the new world.

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